International Institute for Applied Systems Analysis
IIASA www.iiasa.ac.at

How Much Does It Cost to Join the European Union and Who Is Going to Pay for It? Cost Estimates for the Czech Republic, Hungary, Poland and Slovenia, Complying with the EU Environmental Standards

Dziegielewska, D.A.

IIASA Interim Report
January 2000

International Institute for Applied Systems Analysis
Schlossplatz 1 • A-2361 Laxenburg • Austria
Telephone: (+43 2236) 807 342 • Fax: (+43 2236) 71313
E-mail: publications@iiasa.ac.at • Internet: www.iiasa.ac.at

Interim Report IR-00-001/January

How much does it cost to join the European Union and who is going to pay for it?
Cost estimates for the Czech Republic, Hungary, Poland and Slovenia, complying with the EU environmental standards

Dominika Anna Dziegielewska (e-mail: dominika.dziegielewska@yale.edu)

Approved by

János Gács (gacs@iiasa.ac.at)
Project Leader, Economic Transition and Integration

January 2000

Contents

Abstract

This research is devoted to the estimation of the costs of compliance with European Union environmental standards, and the identification of distributional patterns of the cost bearing. In particular, this work is focused on the case of four Central European countries bordering with the EU, namely the Czech Republic, Hungary, Poland, and Slovenia. The goal of this study is to estimate costs associated with two scenarios: (1) an accession scenario that assumes a situation where the four countries access the EU in the year of 2005; and (2) a status quo scenario that assumes a situation where the four countries do not access the EU until 2010. In addition, scenario (2) has two possible versions: (2a) in which the countries' poor development and failure to comply with the EU regulations prevent accession, and (2b) in which the four countries are ready to access the EU by 2005, but the European Union is not ready for the enlargement. The cost estimation approach that is employed here is dictated by the time constraint of the author. Therefore, the results are not based on original macroeconomic or CGE models, but on the extrapolation and forecasting of available results.

Further, the total costs associated with the above scenarios are disaggregated into costs of investment by the private sector and costs of investment by the public sector. The final stage of the research involves identification of major actors who will eventually bear the costs of the investment as well as an evaluation of the distribution of costs among them.

About the Author

Dominika Anna Dziegielewska was participant in the 1999 Young Scientists Summer Program. She got her MA and BA degrees in sociology at Warsaw University, was Ph.D. student at the University of Maryland, and is currently a graduate student at the Yale School of Forestry and Environmental Studies, Yale University. Her dissertation will deal with the assessment of the welfare consequences of the harmonization of environmental standards.

How much does it cost to join the European Union and who is going to pay for it?
Cost estimates for the Czech Republic, Hungary, Poland, and Slovenia, complying with the EU environmental standards

Dominika Anna Dziegielewska

Part I: Introduction and Problem Statement

This paper is devoted to the estimation of the costs associated with the EU enlargement process[1], and specifically with the costs associated with the compliance of the candidate countries with EU environmental standards. The countries of interest are four countries currently bordering the European Union, namely Poland, Slovenia, Hungary and the Czech Republic. In addition to the total cost estimations, this research also attempts to shed some light on the final distribution of these harmonization costs. Typically, the initial costs of any environmental investments are incurred by the public sector and then transferred through the system of taxes, user charges and fees to the private sector. The extent of the transfer depends on the degree to which the current national environmental policy incorporates the so called "polluter pays principle" that encourages full cost recovery. In addition, it is possible to identify how the investments in both the private and public sectors are further distributed among particular groups in the societies and to evaluate the proportions of the cost sharing burden among typical polluters, i.e. industry and agriculture, and the typical victims, i.e. consumers and households.

The EU environmental legislation contains over 240 directives that will need to be applied to each candidate country's existing legal system. Yet, the harmonization does not simply imply transposition of the EU environmental regulations. It requires guarantees that the standards will be established and properly enforced. Therefore, preparation of the EU accession and adoption of the regulations typically means both, to elevate the status of existing regulations as well as to strengthen enforcement capabilities.

---

[1] This work is part of a larger project called PREPARITY (which stands for Structural Policy and Spatial Planning in the Regions along the Boarders of Central and East European Countries in Preparation for the Eastern Enlargement of the EU). The project is managed by WIFO (the Austrian Institute of Economic Research) as well as German and Italian research institutes. The PREPARITY project consists of 16 subprojects out of which one has been carried out at the Economic Transition and Integration Project of IIASA, Austria. This paper is a part of the IIASA subproject designed to conduct country studies and a summary assessment of the expected macroeconomic developments until 2010.

The compliance procedures need to be coordinated with specific national priorities resulting, among others, from the most serious environmental problems at the national level. In general, the priority investment areas in the EU and the candidate countries do not perfectly coincide with each other. The EU countries are mainly concerned with global environmental problems, such as decreasing greenhouse gas emissions, ozone-layer protection, acidification reduction, etc. The candidate countries, on the other hand, are primarily interested in solving the most pressing local environmental problems that usually include particulates and lead reduction, developing sewage treatment systems, or raising the quality of drinking water. In addition, as the most preferable accession scenario, the EU assumes full harmonization of all regulations without transition period in order to minimize the burden to the EU economic system and the natural environment. The candidate countries, on the other hand, prefer to obtain transition periods in as many areas and for as long as possible to lower their annual costs. Therefore, the sequence of investments as well as the length of their time horizon will most likely be the result of compromises on behalf of both sides.

The compliance process in the area of environmental protection will have a significant impact on the overall performance of the whole national economies in the candidate countries. Production associated with high pollution emission, and/or waste production would be substantially reduced as a result of the necessary investment or disinvestment. Consequently, many firms could lose competitiveness and perhaps even close down. In addition, the Central and Eastern European economies that still are in the transition process could be forced to speed up the privatization process in certain sectors since full privatization is often an implicitly necessary condition for environmental harmonization. For example, it has been observed that heavily polluting industries (such as chemical, petrochemical, steel, and paper pulp industries), when state owned, tend to make losses. Consequently, they tend to neglect environmental concerns and disobey the regulations.

The investment burden imposed on the economies of the candidate countries as a result of the harmonization process will be partially compensated by the European Union. It is reasonable to assume that the overall compliance investment required for joining the European Union will make the candidate countries eligible for support from special pre-accession aid funds and that a large portion of the EU aid packet to new members will be directed to environmental investments. For example, there has been a trend in agricultural policy among the current EU member countries to redirect the portion of the EU budget previously channeled in the form of farmer subsidies toward environmental allowances. The main areas supported were the creation and support of wildlife refuges, mid-field ponds, woodlands, as well as chemical throughput reduction (Zylicz, 1997). In general, based on past experience and the EU officials' statements, the candidate countries can expect the EU to cover 10-20% of the national expenditures in the environmental sector (c.f. Gács and Wyzan, 1999).

1.1. Structure of the Research

The more specifically defined goal of this study is to evaluate the financial consequences of the compliance process through analyzing scenarios that mimic the actual accession alternatives. In general, the accession process can have two broadly defined scenarios that exhaust the alternatives of the EU enlargement attempt. The candidate countries can either access the Union or not in a given period of time.

Therefore, the study considers two scenarios, one that assumes a successful accession and the other that predicts an accession failure. The scenarios are defined with respect to assumed accession deadlines, different transition periods and various distributions of financial aid provided by the EU.

1.2. Scenario One: Accession Scenario

The first scenario considered here, also called accession scenario, describes a situation in which the four countries meet the EU requirements and successfully join the Union. For the purpose of this research the date of accession is chosen to be the year 2005. The costs calculated here are forecasted for the period 1998-2005, during which full harmonization without any transition period takes place, and for the period 1998-2005+3, where the full legal harmonization takes place until 2005, and the remaining costs are carried forward into additional 3 years. Consequently, the compliance process is fully completed by 2008. Under this scenario it is assumed that in both cases, with and without transition periods, the candidate countries will be supported by the European Union from pre-accession funds. In addition, as a consequence of the accession, the new members will also be eligible for post-accession aid.

1.3. Scenario Two: Status Quo Scenario

The alternative scenario describes a situation where the candidate countries, despite their attempts, do not manage to access the Union. Therefore the second scenario, also called the status quo scenario, defines a situation where by the end of the forecast period, which was here chosen to be the year 2010, the candidate countries do not join the EU. Since the failure of accession can have two origins, scenario number two has two alternative versions.

The first alternative, called scenario 2a, is defined as a scenario in which the four countries do not access the EU by 2010 due to poor economic development, and noncompliance of the candidate countries with all the EU requirements in time. Scenario 2a is considered in two versions: one, in which for environmental compliance no transition period is granted, so a full harmonization needs to be completed by 2010; and the other, in which a 2 year lag is permitted and the full costs of meeting the standards can be extended to 2012. In addition, it is assumed that the countries would not receive the post-accession EU aid, and that they will have only limited access to the pre-accession funds. The fact that only part of the pre-accession financial aid is assumed to be transferred under this scenario is associated with the anticipated overall disappointment on behalf of the Union which, in the course of time, would be less likely to support policies that do not provide prospects for full harmonization by the deadline.

The second alternative, called scenario 2b, describes a situation where the candidate countries are ready to join the EU by 2005 (all the EU requirements are met), but the European Union, for reasons not related to the candidate countries, is not ready for the enlargement. Consequently, the countries, being non-members, will not be able to receive the post-accession financial aid, but it is assumed that they will receive the full amount of the pre-accession assistance.

Part II: Methodology

In order to analyze the consequences of the two scenarios the following steps are to be taken. First, the total costs associated with the two scenarios are estimated (in terms of percentage of GDP) that will need to be invested in environmental protection each year. The estimates will be based on calculations prepared by experts and authorities in each country. The results then will be extrapolated and forecasted in order to fit the assumed scenarios. The final investment estimates will be then expressed in constant 1998 prices and the costs will be presented in terms of percentage of GDP per year. It is reasonable to predict that the annual costs will not be uniformly distributed and that in the early years of the compliance period the annual cost will be higher. Yet in most cases there is not enough information available to estimate this distribution, and therefore, only yearly average expenditures will be reported.

Next, the total costs of investment will be disaggregated into costs of investment in the private sector and costs of investment in the public sector. Finally, major actors who will bear the costs of the investment will be identified and a proportion of the total costs will be assigned to each of them.

2.1. Definition of the Total Costs of Harmonization

The first element that needs to be defined here is the total costs of the harmonization. Theoretically, the costs that should be captured here are the additional costs imposed on the economies as a result of their compliance with the EU standards. Therefore both, the costs of improving environmental quality from the status quo to the quality defined by the EU directives, and the costs associated with quality improvement that would occur as a result of a national environmental policy if the accession is not be considered, need to be measured. Such an analysis would require an approximation of long-term trends in environmental policy as well as quality improvements not associated with attempts related to the environment on behalf of industry and agriculture, but related to competitiveness. In addition, the "natural" reduction in the emission levels in the Central and East European economies that are not attributed to a pollution reduction endeavor, but simply to the output reduction that occurred at the beginning of the economic transition period, would need to be evaluated. Unfortunately, none of the four candidate countries in question was able to provide cost estimates that would single out the additional costs associated purely with the harmonization. Therefore, the estimates presented here provide the costs of moving from the current environmental quality level to the one attributed exclusively to meeting the EU standards, as defined in the EU directives. Consequently, the estimates can be perceived as an upper bound of the predicted costs with the assumption that all of the four countries would very likely incur part of the cost in these areas, even if the EU accession was not considered at all.

For the purpose of this study, the total costs of the harmonization process can be thought of as having two major components: (1) administrative and institutional costs, and (2) socio-economic costs. The EU legislation allows member countries to manage compliance with the EU directives in a variety of institutional settings. Yet, all candidate countries will, in some instances, have to reform existing institutions or introduce new institutional solutions, as well as increase administration staff employment in order to implement and monitor compliance with the new standards.

For example, in the case of air quality control, the measuring network, i.e. data centers for continuos monitoring and for operation of signaling as well as alarm systems will need to be strengthened. In addition, establishing a uniform data processing and transfer system of measuring stations and networks will be necessary.

Legislative changes will need to be accompanied by necessary expertise to redefine country-specific laws to match the EU directives. The implementation and enforcement of the new legislation will require an increase in the number of employees as well as development of their legal competence and technical skills. Therefore, both professional and language training programs will need to be provided for old and new administrative employees.

The socio-economic consequences are estimated here in association with particular environmental areas. The areas are described by a set of directives considered as the ones that most comprehensively capture the area-related requirements. The general areas of interest that can be used to define the whole field of environmental policy, and which would be used here as basic units for cost estimate are air and water pollution, waste management, forestry and nature protection, industrial pollution and risk management, as well as chemical substances and genetically modified organisms.

Finally, the costs considered here are gross costs that provide only one side of the cost-benefit balance. These results, on their own, cannot be used to derive any general conclusion on whether the harmonization process is worthwhile for the candidate countries. The benefits, not estimated here, associated with the harmonization process would primarily include lowering health risk, lowering pressure on local ecosystems as well as in some cases increasing production efficiency. It has been observed that higher environmental standards often lead to a more efficient use of input induced by the pressure to reduce pollution emission and waste production as well as by providing incentives to develop and implement new technologies.

2.2. Time Horizon and Unit of Estimation

The two components, i.e. the administrative and institutional as well as the socio-economic component, are associated with different time frames. The harmonization deadline, as will be defined by the EU (or as is defined for the purpose of this study in the two scenarios) will be strictly limited to covering only the administrative and institutional costs. The goal of meeting all the standards as defined in particular directives will most likely be an element of negotiations between each country and the EU. In practice countries can gain extra time to meet some of the directives and the timing may vary for each of them. Yet, for the purpose of this study, the transition periods are unified across all four countries and are 3 and 2 years for scenario one and 2a, respectively.

An additional concern is the definition of a basic unit for carrying out the estimates. The typical units that are used in environmental cost estimations are either directives or problem areas. This widely used approach is associated with cost estimation of introducing and complying with particular directives. This approach, however, can lead to several methodological problems. For example, many directives impose costs on more than one field, and protection of some fields is defined by more than one directive. As a result, the costs calculated based on the directive-by-directive approach tend to overestimate the totals.

2.3. Total Cost Disaggregation

The total cost will be borne by both the private and the public sector. This total investment will be further disaggregated into specific socio-economic groups who will potentially end up carrying the burden. In addition to industry, agriculture, and governmental budgets (at the central and municipal level), which are obvious cost burden participants, the environmental investments will impose high costs on households. For example, households will most likely finance a large portion of the air pollution reduction costs, by being forced to switching from coal-based heating to more efficient and convenient gas and district heating systems. Furthermore, since households currently using coal tend to be in a lower income group, one can expect that a large part of the burden would be imposed on the lower income groups of the candidate countries' societies. In addition, meeting environmental requirements will indirectly affect energy and water prices, as well as sewage and waste disposal charges. The increase in these prices will further affect prices of other products and services.

Part III: Country Estimates

3.1. Slovenia[2]

3.1.1. Background Information

The process of complying with the European Union standards requires Slovenia to reach the general goals defined in the National Environmental Action Plan (NEAP), an official document drawing up the future environmental policy in the country. The primary aims described in NEAP are related to the areas of ground water pollution, solid waste management as well as biodiversity preservation (Radej, 1999).

3.1.2. Total Cost Estimates

The total costs of compliance with the EU directives in Slovenia is estimated, according to the SLO-101 report, to be about bln EUR 2.7. Therefore, under scenario number one, when Slovenia accesses the European Union by the year 2005 and no transition period is granted, the annual burden on the Slovenian economy will correspond on the average to 1.56% of the GDP per year.[3] When the socio-economic costs are extended over three additional years, so that the full compliance will occur in 2008, then the costs will be reduced to 1.07% of GDP per year.

The costs associated with scenario 2a, in which Slovenia would not be able to join the Union due to the failure of full compliance with all the accession requirements, will be on average equal to or less than 0.87 % of GDP per year, assuming no transition period, and less than 0.72% of GDP if additional 2 years for the socio-economic investments are permitted. These investment amounts are used here as reference points, and are associated with full environmental compliance by 2010 and 2012, respectively.

---

[2] This part has been prepared based on *SLO-101. Development of a Costing Assessment for the Slovenian Environmental Approximation Strategy*, 1998.

[3] For details see Table A1.2. in Appendix 1.

Under scenario 2a, however, i.e. if by the year 2010 Slovenia will not be ready to comply with EU environmental requirements, the total investment will probably be smaller. Its precise value will depend on the degree of environmental compliance. In addition, as a result of no accession, Slovenia would also most likely not receive the full financial aid from the European Union pre-accession sources, predicted to be 10-20% of the total costs of the necessary environmental investment. Therefore, the final allocation of costs will need to be covered from domestic sources.

Under scenario 2b, which assumes a situation in which Slovenia is ready to join the Union by the year 2005, but by 2010 the EU is still not ready for the enlargement, the average yearly expenditures on environmental protection will correspond to 1.56% of the GDP. Under this scenario, Slovenia will most likely have access to the pre-accession funds, yet it will not receive the financial aid from post-accession funds.

3.1.2.a. Administrative and Institutional Costs

The cost figures presented in section 3.1.2. are derived from two cost components, administrative and institutional, as well as socio-economic costs. According to the SLO 101 estimates, the necessary investment in building and restructuring the institutional structure, increasing employment, providing extra training, monitoring and law enforcement, will be about mln EUR 14.4. This relatively small amount is about half a percent of the overall compliance costs, and thus almost negligible.

3.1.2.b. Socio-economic Consequences

The remaining 99.5% of the overall costs is associated with actual investments devoted to meet all the EU environmental standards. Three fields that require the highest investment (altogether 93% of the socio-economic costs) are water and air pollution as well as waste management (see Table 3.1.1. below).

Table 3.1.1.

Costs of environmental investment, mln EUR '98 and %

Category:	Costs	
	mln EUR	**%**
• **Water**	1183	43.4
• **Air**	241	8.8
• **Waste management**	1118	41.0
• **Genetic materials**	3	0.1
• **Forest & nature protection**	120	4.4
• **Industrial pollution**	50	1.8
• **Horizontal**	10	0.4
TOTAL:	**2725**	**100**

3.1.2.b.i. Water Pollution

The cost of water pollution reduction will be about mln EUR 1183, which is about 43% of the overall costs. This investment that constitutes the largest part of the total compliance costs will be devoted to applying the same treatment for industrial and urban wastewater, to pre-treatment of main drinking water sources in Slovenia, namely surface and ground waters, as well as to meeting particular requirements for secondary and advanced treatment of municipal waste water.

3.1.2.b.ii. Air Pollution

The total cost of air pollution reduction will be about mln EUR 241, which is about 9% of the overall costs. This cost will be mainly associated with emission reduction of the three primary air pollutants, namely SO_2, particulates, and NO_x. The relatively low cost, as compared to cost of air pollution reduction in the remaining three candidate countries in this study, is associated with the fact that over the last years environmental policy in Slovenia has focused essentially on the reduction of SO_2, the major air pollutant. As a result of this policy, emission has been reduced by over 34% during the period 1991-1997 (*Statistical Yearbook of the Republic of Slovenia*, 1998). The remaining necessary reduction of SO_2 as well as the reduction of particulate matter in Slovenia will be associated with further investments directed towards refurbishing or closing thermal power plants and district heating plants, whose technology is still based on coal burning. In addition, the reduction of emission of nitrogen oxide will be required. Here investments will have to be made in order to build new gas-fired power plants.

3.1.2.b.iii. Waste Management

Mln EUR 1118 will be devoted to meeting the EU standards associated with the broadly defined area of waste management. This investment is the second largest component (41%) of the overall costs. It will be devoted to the investment in technical facilities for recycling and reusing facilities which are currently very rare in Slovenia; municipal and hazardous waste incineration, as well as the closure of the currently existing 53 landfills with full leachate control; ground water monitoring, gas extraction and fencing are also significant tasks in this context. In addition, Slovenia will need to change current practices in agriculture by introducing composting facilities as well as asbestos waste utilization.

3.1.3. Total Cost Distribution

3.1.3.a. Public and Private Investment

The total costs that include both the administrative and the socio-economic element will be borne by both the private and public sectors. However, the main investment of over bln EUR 2, that is about 70% of the total costs, will be carried by the public sector. The private sector will contribute about mln EUR 755, which is roughly 30% of the total costs (see Table 3.1.2.).

Table 3.1.2.

Private and public investment distribution, mln EUR '98 and %

Category:	Private		Public		Total
	mln EUR	%	mln EUR	%	mln EUR
• **Water**	319	27	863	73	1183
• **Air**	72	30	168	70	241
• **Waste management**	358	42	760	68	1118
• **Genetic materials**	1.17	39	1.83	61	3
• **Forest & nature protection**	0	0	120	100	120
• **Industrial pollution**	50	100	0	0	50
• **Horizontal**	5	50	5	50	10
TOTAL:	**755.17**	**30**	**1917.83**	**70**	**2725**

3.1.3.b. Final Cost Allocation

According to SLO 101, the final distribution of cost bearing will involve four major actors, i.e. the central government, municipalities, industry and households (see Figure 3.1.1. below). [4]

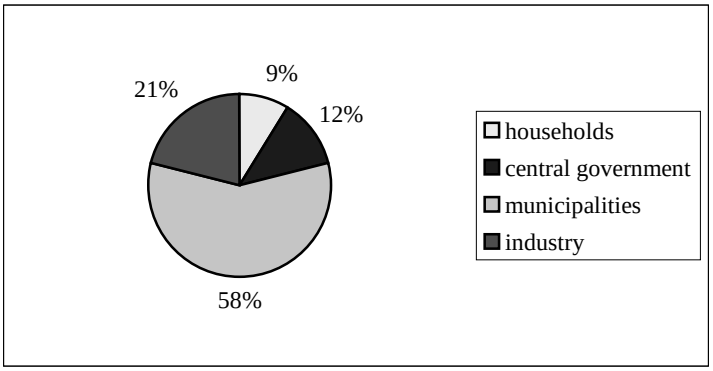

Figure 3.1.1. Final distribution of costs

Thus, the major burden of the investment will be imposed on municipalities, which will need to contribute mln EUR 1041, about 58% of the total necessary investment. The central government will end up covering only 12% of the costs (mln EUR 224), while industry will contribute 21%. Only 9% of the overall costs will be imposed on households, which is most likely due to the fact that air pollution, a major factor transferring the costs onto households through higher prices, has already been substantially reduced in Slovenia.

[4] For details see Table A1.3. in Appendix 1.

3.2. Czech Republic[5]

3.2.1. Background Information

In 1990 the Czech Republic, then part of Czechoslovakia, was considered to be the second largest per capita SO_2 emitter in Europe as well as a leading polluter in the areas of water and other air pollution. In the period of 1990-96 the emissions started to decrease significantly, which was partially due to a general trend of output decline, but also to a carefully planned environmental policy. For example, SO_2 production dropped to the point where the emission in 1996 was about 23% of that in 1990 (*Statistical Yearbook of the Czech Republic*, 1998). Yet, despite the significant improvement of the environmental quality in the Czech Republic in the 1990s, still a large amount of investment is necessary in order for the country to reach the environmental protection level defined by the EU directives.

The national priorities recognized by the country with regard to the environmental improvement include human health protection and conservation of biodiversity, which, in terms of the environmental areas as defined in this paper, would be air and water pollution reduction as well as forestry and nature protection.

3.2.2. Total Cost Estimates

The estimated total costs of the Czech Republic to comply with the European Union environmental standards are approximately bln EUR 7.1. Thus, if the Czech Republic accesses the European Union by the year 2005 not applying for a transition period, then the annual burden on the Czech economy will correspond on average to 1.65% of GDP per year.[6] If a 3-year transition period is chosen, then the average cost will drop to 1.05% of GDP per year. It is also predicted that in both cases, with and without transition periods, the Czech Republic will receive both pre- and post-accession aid from the EU.

Under scenario 2a, in which the Czech Republic will fail to meet all the compliance requirements, the yearly burden will correspond to less than 0.86% of GDP if no transition period is granted, and less than 0.76% if the final deadline for full harmonization is 2012.

If, however, the Czech Republic is ready to join the Union by the year 2005, but by 2010 the EU is still not ready for the enlargement, then the average yearly expenditures on environmental protection will be on average equal to 1.65% of the GDP. Similarly to the Slovenian case, in this scenario the Czech Republic will lose the post-accession aid.

The amount of compliance costs based on the estimates from *National Programme...* (1999) is relatively low compared to the actual environmental investment costs of the Czech Republic. For example, the environmental expenditures during 1993-1998 accounted approximately for 2.2 - 2.5% of the GDP (*Environmental*

---

[5] This part has been prepared based on *National Programme on Preparation of the Czech Republic for Accession to EU, Environment*, an internal document obtained from the Polish Ministry for Environmental Protection. Relevant documents or publications from the Czech Republic were not available.

[6] For details see Table A2.3. in Appendix 2.

Performance Review, 1998). Thus, the estimates suggest that the compliance process would be easily affordable for the Czech Republic. Yet, this does not necessarily have to be the case. The study from which the total harmonization costs are provided raises some serious methodological concerns and suggests that the estimates can be heavily understated. The detailed presentation of these possible problems will be presented below.

3.2.2.a. Administrative and Institutional Costs

According to the estimates, the costs of institutional capacity building and reforming will require investments of about mln EUR 78. Out of this amount, a substantial portion of the state budgetary costs will be devoted to hiring additional staff members, who will implement and monitor the compliance with the new legislation. The necessary increase in the administrative employment, according to estimates of *National Programme...*(1999), will be about 1000-1500 people[7] and the costs will be about mln EUR 70. Institutional strengthening will also require investment in necessary material equipment and this will cost about mln EUR 8. The major part of these expenditures will be designated to the Ministry of the Environment (MoE), the Czech Environmental Inspectorate (CEI), and State Environmental Funds (SEF), mostly at the lower administrative levels.

3.2.2.b. Socio-economic Consequences

The costs of investment in meeting the EU regulations will be almost bln EUR 7, which constitutes about 99% of the total costs (see Table 3.2.1.).

Table 3.2.1.

Costs of environmental investment, mln EUR '98 and %

Category:	Costs	
	mln EUR	**%**
• **Water**	4064	58.66
• **Air**	1750	25.26
• **Waste management**	881	12.71
• **Genetic materials**	104	1.50
• **Forest & nature protection**	1.5	0.02
• **Horizontal**	4	0.06
• **Noise**	123	1.77
TOTAL:	**6927.5**	**100**

3.2.2.b.i. Water Pollution

The main investment associated with meeting the EU standards will be devoted to water protection to meet the 91/271/EEC directive considering *Urban Waste Water Treatment.* The overall cost of raising the water standard is estimated to be about mln EUR 4064 (59% of the total cost), and covers drinking water supply, wastewater treatment and protection of surface waters. Half of this amount, which is about mln

[7] For details see Table A2.2. in Appendix 2.

EUR 2034, needs to be invested in wastewater treatment and drinking water supply, while the other half is going to be devoted to surface water protection. Due to the scale of the investment, water protection, which constitutes by far the largest portion of the total investment costs, will require a longer time horizon for full compliance with the EU regulations. Most likely, the Czech Republic will apply for a 3-5 year transition period (*National Programme*, 1999).

3.2.2.b.ii. Air Pollution

The costs of air pollution improvement are estimated to be about mln EUR 1750, which is about 25% of the total costs. These costs will be mainly devoted to switching from coal to gas or smokeless solid fuels. These estimates do not include costs associated with mobile sources emission reduction, i.e. pollution from transportation which is a substantial contributor to the overall air pollution emission. The fact that these costs are not included in the estimation is a special source of concern, as the amount of cars in the Czech Republic is growing rapidly (the amount of passenger cars rose by 74% during the period of 1990-1997)[8] and since 75% of the cars currently in use do not have catalytic converters installed. As a result, the air pollution cost estimates to meet the EU standards are heavily underestimated. The costs that have been ignored include costs of transport infrastructure improvement, investment in public transportation, replacement of a large amount of old cars, and installation of catalytic converters. In addition, the relatively low cost figure of air pollution reduction could also be associated with the fact that over the past years, similarly to Slovenia, the Czech Republic's main investment was devoted to air pollution reduction.

3.2.2.b.iii. Waste Management

The costs of waste management related investments are estimated to be about mln EUR 881, which is about 13% of the total costs. This amount will be devoted mainly to construction and managing new incineration plants as well as closing down or refurbishing existing ones. The technical specifications of landfills and incineration plants are already included in the new law that was meant to be designed as a major step in the harmonization process. Yet, there are still issues that need to be addressed in the new legislation which will cover recycling, use of waste as energy source, management of sludge from wastewater plants, and utilization of PCB and batteries.

3.2.3. Total Cost Distribution

3.2.3.a. Public and Private Investment

The total cost will be borne by both the private and public sectors (see Table 3.2.2). The main burden of over bln EUR 6.5, i.e. about 96.6% of the total costs, will have to be picked up by the private sector. The public sector will contribute about mln EUR 240, which is roughly 3.4 % of the total costs. Sources of public funding will be provided by the budgets of municipalities supported by the Ministry of Interior (since most of the responsibilities for environmental protection are delegated to the municipal level), the budget of the Ministry of Agriculture that mainly supports activities in water protection, the State Environmental Funds that tend to finance a broad range of environmental protection activities, the National Property Fund that mainly invests in

[8] Based on *Statistical Yearbook of the Czech Republic* (1998).

pollution control, as well as International Financial Institutions. Overall, the state budget of the Czech Republic will cover about mln EUR 120.

Table 3.2.2.

Private and public investment distribution in mln EUR and percent

Category:	Private		Public		Total
	mln EUR	%	mln EUR	%	
Socio-economic:					
• **Water**	4053.3	99.7	10.7	0.3	4064
• **Air**	1742.7	99.6	7.3	0.4	1750
• **Waste management**	867.7	98.5	13.2	1.5	881
• **Noise**	0.0	0	123	100	123
• **Genetic materials**	102.6	98.7	1.4	1.3	104
• **Forest & nature protection**	0.0	0	1.5	100	1.5
• **Horizontal**	0.0	0	4	100	4
Administrative:	0.0	0	78	100	78
TOTAL:	**6766.3**	**96.6**	**239.1**	**3.4**	**7005.5**

These results raise additional concern with respect to the quality of the overall estimates. The public/private distribution contrasts dramatically with the corresponding distribution in the other three candidate countries in this study, where the public sector is expected to contribute 60-80% of the total cost.[9]

The suggested Czech distribution contrasts also with the actual expenditures during 1993-1998, where the total costs of investment were split almost equally between the private and public sectors (*National Programme*, 1999). Therefore the above cited low cost targets may most probably have been achieved through ignoring a substantial part of investment that is going to be carried out by the public sector.

3.3. Hungary

3.3.1. Background Information

The officially recognized environmental priority areas in Hungary include sewage discharge and treatment, air quality and waste management (Ministry, 1999).

3.3.2. Total Cost Estimates

The total cost of investment for Hungary to meet the EU environmental standards will be bln EUR 9.5-10.3 according to estimates provided by Kerekes and

[9] There is no available information about private-public distribution of harmonization costs for Poland, yet the actual expenditures in the past years show a pattern of 60-70% contribution from the public sector.

Kiss (1998)[10], and bln EUR 11.5-13 according to estimates of the European Commission (c.f. Compliance Costing, 1997) as also cited by Ministry (1999). Therefore, the total costs can be assumed to fall within the range of bln EUR 9.5-13.

Under scenario one, in which Hungary accesses the EU in 2005, the annual average investment will be 2.12 - 2.90% of GDP if there is no transition period.[11] If Hungary is allowed to take 3 extra years, then the costs will drop to 1.44 - 1.97% of GDP.

Under scenario 2b, in which Hungary is ready to join the Union by the year 2005, but by 2010 the EU is still not ready for the enlargement, the average yearly costs would still be 2.12 - 2.90 % of GDP. However, Hungary would lose the post-accession financial assistance.

The costs of compliance for these scenarios are very high. In 1996, Hungary invested in environmental protection 1% of the GDP, in 1997 1.1%, and the expenditures for 2000-2002 are predicted by the National Environmental Programme to be at a maximum of 1.7% (cited by Kerekes and Kiss, 1999). Thus, the minimum expected costs are much higher than the upper bound of the predicted maximum expenditures. Therefore, we can anticipate that Hungary will need to apply for a long transition period, at least for investments in the areas that are associated with the highest costs.

The costs associated with scenario 2a, in which Hungary will not join the Union due to its failure of full compliance with all the accession requirements, will be on average less than 1.17-1.60% of the GDP, and with 2 years transition period the cost will be less than 0.97-1.39% of the GDP per year. Thus, the maximum estimated costs will in this case fall below the ceiling predicted by the National Environmental Programme. In this scenario, however, Hungary could lose part of the pre-accession funds from the EU which, according to predictions provided by the Ministry of Foreign Affairs, will cover about 11% of the total environmental harmonization costs.[12]

Given the overall estimates, if the actual accession deadline is set for 2005, Hungary will need to apply for at least 5 years transition period to reach costs lower than the ceiling of 1.7.% of GDP. Yet, even a longer transition period would most likely be recommended to increase the probability that the environmental costs will not be an overwhelming burden to the national economy.

3.3.2.a. Administrative and Institutional Costs

The total administrative costs will be about 2% of the total costs of harmonization. The necessary increase in administrative staff employment according to estimates (Ministry, 1999) is about 22-24%. The staff of the environmental inspectorate network will need to be increased by 260-280 people (Ministry, 1999). It will also be necessary to increase employment in the Institute for Environmental Protection, the Ministry for Environmental Protection, and the National Inspectorate for Environmental

[10] The total costs of harmonization calculated by Kerekes and Kiss (1998) are bln EUR 6.8-7.6. These estimates yet do not include the cost of pollution reduction form transportation, which, as provided in the report, are equal to bln EUR 2.5. For details see Table A3.1. in Appendix 3.

[11] For details see Table A3.2.a and b in Appendix 3.

[12] Fore details see section 3.3.3.

and Nature Conservation. The necessary staff increase will be 30 extra people in regional bodies (Ministry, 1999).

In addition, monitoring and enforcement standards will need to be elevated. For example, in the area of air pollution reduction, in addition to stricter emission standards, the EU air pollution regulations impose also stricter regulations concerning data and information exchange. The necessary investments in the administrative and institutional network will need to be devoted to strengthening measuring and monitoring, as well as to the signaling and alarm network.

3.3.2.b. Socio-economic Consequences

The overall socio-economic costs will constitute about 98% of the total costs and will be mainly devoted to investments in air and water protection and pollution reduction as well as waste management (see Table 3.3.1).

Table 3.3.1.

Costs of environmental investments in bln EUR ('98)

Category:	%* distribution	Costs in bln EUR Kerekes and Kiss	EC	
• **Water**	34	3.2-3.5	3.7	4.4
• **Air**	37	3.5	4.1	4.8
• **Waste management**	18	1.8-2.3	2.1	2.5
• **Others**	11	1.0	1.0	1.4

* The percentage distribution among subject areas are calculated based on estimates presented by Kerekes and Kiss (1998) after inclusion of the costs of air pollution reduction from mobile sources. The EC total cost estimate is from Compliance Costing (1997).

3.3.2.b.i. Water Pollution

The costs of pollution reduction and protection of waters will be about 34% of the total costs and will be in the range of bln EUR 3.2 - 4.4. They will cover investments in urban wastewater treatment, dangerous substances and nitrate concentration reduction, sewage sludge as well as meeting the quality of EU standards for surface and groundwater. The major contribution to these cost will be investments in meeting the EU standards regarding sewage collection and treatment.

3.3.2.2.ii. Air Pollution

The total costs of air pollution reduction will be about 37% of the total costs and will fall into the range of bln EUR 3.5 - 4.8. The general goal of the investment will be to reduce emissions from industrial and service activities and from the use of certain products. Additional licensing practices, technology modifications and/or replacement of equipment will then be necessary to reach the goal. The emissions caused by traffic will need to be reduced as well, since road traffic through settlements and main traffic roads are the main factors contributing to the overall air pollution emission. Finally,

technological development and investment will be required to decrease emissions from existing large combustion plants, which should also lead to a higher energy efficiency.

3.3.2.2b.iii. Waste Management

The total costs of waste management investment will be about 18% of the overall costs and will fall into the range of bln EUR 1.8-2.5. The overall task of waste management will include municipal, industrial and hazardous waste disposal and management. In general, minimization of waste production, recovery of produced waste, disposal of non-usable waste will need to be included into the framework of production.

Currently 30% of the non-hazardous waste is processed by the waste producers, about 40% is sold either within the country or abroad (the latter less than 0.5%). Hazardous waste treatment requires building 2-3 regional hazardous waste treatment incineration plants, modernization of existing plants, as well as the creation of at least one waste landfill site (Ministry, 1999). Additional investment will need to be made to raise the standards of treatment of dry cells, vehicle batteries, waste oils, PCB/PCT, waste from refrigerators and coolants, the construction of selective collection system, packing and packing waste treatment. Currently less than 30% of the packing materials are recycled, while the EU regulations will require Hungary to increase the recycling to at least 50% (Ujvári, 1999).

The necessary investment will also need to be carried out in construction of disposal sites, the extension of incineration capacity, spreading of composting, precise separation of hazardous and useable components, and selective collection and processing. A lot of investment in this area will be covered by the Environmental Fund that would support local authorities as well as investments by individual enterprises.

3.3.3. Total Cost Distribution

The distribution of the total cost among private and public sector is estimated by the Ministry of Foreign Affairs (Ministry, 1999). The expected investment carried out by the public sector (at central [50%] and local [12%] levels) will be about 62% of the overall cost.[13] Only 11% will be contributed by the European Union from pre-accession funds and 27% will be imposed on private companies (see Figure 3.3.1. below).

This distribution is skewed toward the public sector, but this skewedness is expected to change in the future. The Ministry predicts that state's involvement in cost sharing will decrease with time as the private sector contribution will increase (Ministry, 1999). Such a prediction seems to follow logically from the fact that the initial costs must be devoted to legislative and institutional changes (financed by the state) and followed by investments associated with meeting standards and enforcing the new laws, which imposes costs on polluters, mainly originated from the private sector.

[13] The distribution is based on the calculation provided in Ministry, 1999 where the time horizon was 1999-2001.

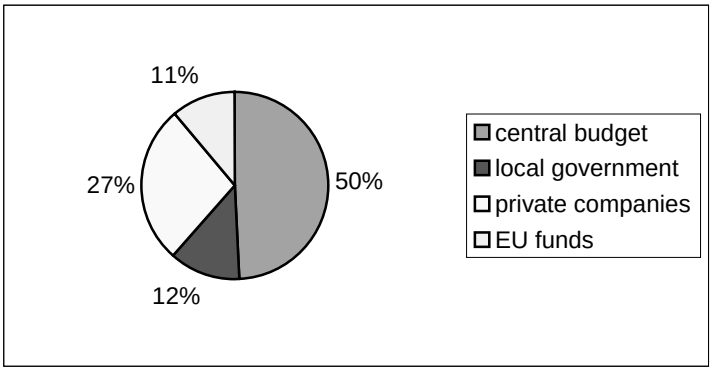

Figure 3.3.1. Costs shares

The amount invested by the central budget (decomposed in Figure 3.3.2 below) will be mainly financed by the Ministry of Interior (56%). The remaining 44% will be equally split between the Ministry of Environmental Protection (22%), and the Ministry of Transport, Communication and Water Management (22%).

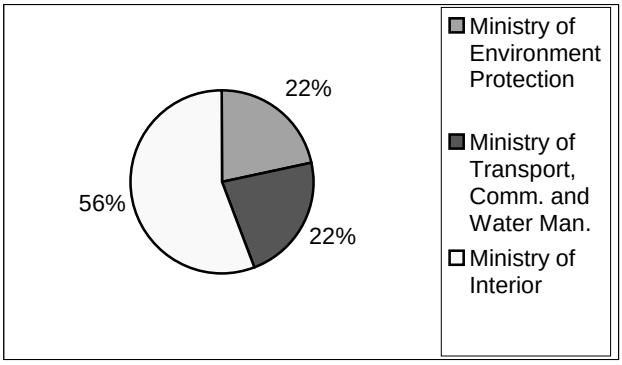

Figure 3.3.2. Investments from the central budget

Given the available information, the share of costs to be imposed on households could not be estimated. Nevertheless, according to Kerekes and Kiss (1999) just the rise in utility prices will lead to the situation where a part of the lower income households would need to devote about 20-25% of their total income to cover the new utility expenditures.

3.4. Poland

3.4.1. Background Information

The environmental policy implemented in Poland since 1990 has been based on the priorities and approaches defined in the National Environmental Policy. It emphasizes the cost effectiveness criterion, application of economic instruments, public

participation, and decentralization of the decision-making structure. The major goal of this design is to gradually coordinate Polish environmental policies with the EU and with international environmental agreements. Special consideration is devoted to the reduction of major health hazards, of air and water pollution, to soil and natural systems protection, to sanitation coverage improvement, thus raising the quality of water supplies as well as taking care of waste disposal. Many emission standards as defined in Polish legislature are very close to or identical with the EU standards. Examples are the requirements for the concentration of power plant pollution and the concentration of municipal sewage pollutants. Some standards are even stricter, such as the one regulating the nitrogen dioxide concentration. However, often the standards are not properly enforced. Other parts of the legislation are less stringent and thus they require both substantive legislative changes, as well as investment into monitoring and enforcement.

3.4.2 Total Cost Estimates

The necessary changes and adjustments will thus require substantial investment in both the private and the public sectors. The available cost estimates (from the World Bank and the Regional Environmental Center in Poland) focus on public sector investment only, and thus the results presented below should be treated as heavily underestimated.

According to the analysis provided by the World Bank, Poland will need to spend bln EUR 22-43 to comply with the EU standards. The range of these estimates is associated with two scenarios considered by the World Bank. The lower bound corresponds to an interpretation of the EU directives that would allow to minimize the expected costs, while sacrificing the overall quality increase. The upper bound is associated with a more strict interpretation of the directives that would induce a higher quality improvement.

Thus, if Poland accesses the European Union by the year 2005 without applying for a transition period, the annual burden on the economy will correspond on average to 1.64-3.17% of GDP, and, assuming 3 additional years, the cost will be lowered to 1.11-2.16% of GDP.[14] These estimates show that the total costs of harmonization under the high cost scenario substantially exceed the actual expenditures carried out in Poland over the past years. For example, environmental expenditures in 1996 as well as in 1997 accounted approximately for 2% of the GDP (*Statistical Yearbook of the Republic of Poland*, 1998)[15]. The 2% of GDP devoted to environmental protection expenditures also corresponds to the average expenditure in the developed world and thus is often treated as a threshold above which the burden on the economy is dangerously high. The relatively high costs may suggest that for the areas that impose the highest costs it will be necessary to request a transition period.

Under scenario 2b, i.e. if Poland is ready to join the Union by the year 2005, but by 2010 the EU is still not ready for the enlargement, the average yearly expenditures on environmental protection will also correspond to 1.64-3.17% of GDP. In addition, in case of no accession, Poland will, as the other candidate countries, lose the post-accession funds. Under scenario 2a, if no transition period was granted, the costs will

[14] For details see Table A4.1. in Appendix 4.
[15] The 2% includes both expenditures for environmental protection (1.6%) and water management (0.4%).

be in the range of 0.90-1.74 % of GDP, and in the case of a 2 years transition they would be 0.75-1.45 % of GDP. Furthermore, the expected contribution from the EU pre-accession funds will be lower.

3.4.2.a. Administrative and Institutional Costs

Poland has already transposed many EU directives into its national legal system, but the process has not yet been completed. The greatest investment needs to be carried out, however, by the introduction of credible arrangements for permits and enforcement. The compliance requires changes in the form of establishing institutions capable of implementing the legislation, as well as changes within existing agencies and different levels of government. Poland also needs to continue the process of decentralization of its decision-making structure. For example, local and regional authorities (voivodships) should carry the primary responsibilities for issuing permits and enforcing compliance with the permit system.

3.4.2.b. Socio-economic Consequences

The main investment as predicted by the World Bank will be in the water, power, waste and domestic heating sectors (see Table 3.4.1.).

Table 3.4.1.

Costs of environmental investment, mln EUR ('98) and %,

World Bank estimates

Category:	**Costs**	
	Mln EUR	**%**
• **Water**	12.2 - 20.7	48-55
• **Air**	4.8 - 14.5	23-34
• **Waste management**	2.5 - 4.3	10-11
• **Others**	2.6 - 3.3	8-12
TOTAL:	**22.1 - 42.8**	**100**

3.4.2.b.i. Water Pollution

The costs of compliance with the EU directives in the water sector (drinking water, sewers, wastewater treatment) is estimated to be bln EUR 12.2-20.7, which is 48-55% of the total costs. Meeting the EU regulations regarding collecting and treating wastewater is the largest portion of the total costs (World Bank, 1999). Currently 80% of the surface waters do not meet the EU standards, only 15% of urban wastewater is in compliance with the EU requirements. In addition to severe shortage of wastewater treatment plants, many of the existing plants do not perform well. The EU requires that by 2005 almost all urban areas with a total waste discharge for a population over 2000 have a waste water sewer system and go through at least secondary treatment. One of the major burdens associated with harmonization will thus be for Poland to install the secondary treatment plants in small rural settlements. In fact, 25-40% of the rural population will be required to have a sewage system (World Bank, 1997).

In addition, drinking water directives will raise the current Polish standards with respect to lead, pesticide residues, and byproducts of chlorination.

3.3.2.b.ii. Air Pollution

The costs of meeting the EU air pollution standards is going to be bln EUR 4.8-14.5 which is 23-34% of the total costs. The costs would mainly be devoted to particulates and sulfur dioxide emission reduction. Ambient levels of particulates exceed the EU standards in many urban areas. The reduction will need to be achieved from mobile sources and domestic heating facilities. For example, in the Silesia area, 80% of the exposure to particulates comes from household boilers. According to the World Bank estimates, in the whole country about 0.9-1.2 million households will need to convert to district heating or gas. About 60% of households currently using coal will convert to gas and 40% to district heating (World Bank, 1999). The experience shows that fuel switching will need to take place mainly in household heating, small district heating plants, as well as in small industrial and commercial companies (World Bank, 1997).

In addition, sulfur dioxide reduction is one of the major issues in Poland. Although the total emission of SO_2 has been steadily decreasing (for example in 1996 the total emission was 74% of the 1990 emission), a further reduction is still required. The main reduction target is going to be a reduction in the power sector emissions (in 1995-1996 it was responsible for 50% of the total SO_2 emission in Poland), since this is the source from which the reduction has proved to be least expensive (World Bank, 1997).

3.4.2.b.iii. Waste Management

Poland has recently updated most of its waste management legislation, yet the implementation of the directives still needs to be carried out. The investment in constructing new incinerators is going to be a large part of the waste management costs. Currently Poland has almost no incinerators of municipal waste due to the fact that 90% of waste is landfilled. Yet, in case of one third of the existing landfills, their capacity has already been exhausted. In addition, the quality of the remaining two thirds is highly questionable. In the field of investment in non-hazardous waste facilities, Poland also has to increase substantially the current level of recovery and recycling, which is 40% of paper, less than 10% of glass, 2-3% of plastic, and 15-20% of metals (Polish, 1999).

3.4.3. Total Cost Distribution

The total necessary investment associated with the compliance process will need to be shared between the private and public sectors. The public sector (national budget, municipal budgets, and environmental funds) used to finance about 60-70% of the total environmental expenditures (World Bank, 1999), but the estimates of its actual contribution to harmonization cost sharing are not available at this time.

3.4.3.a. Final Cost Allocation[16]

Compliance with the EU emission standards will impose a significant burden on most industries, both local and central government, as well as consumers. Those industries

[16] This section is based on (World Bank, 1999).

that are likely to experience the highest cost burden are those that belong to major contributors to environmental degradation. The classical heavy industrial polluters in Poland include steel, paper pulp and petrochemical industries. The major responsibility for the environmental investment will be imposed on municipalities that are going to be responsible for investment in the water supply system, sewage and solid waste management, and local air pollution improvement. It will most likely not be feasible to cover the investment from municipal budgets and borrowings, and thus municipalities will have to design mechanisms of collecting resources from the private sector.

The harmonization process will also increase the prices of utilities which will have a substantial impact on household expenditures. Under the low-cost scenario, which allows households to switch from coal burning to smokeless fuel (instead of a mandatory switch to gas or district heating assumed under the high cost scenario), it is predicted that both rural and urban households will be affected in a similar way. Under the high-cost scenario, though, the poorer urban households will be most strongly affected, since this is the group who predominantly uses a heating system based on coal burning and who will be forced to convert to gas and district heating.

Finally, part of the costs will be covered from pre-accession funds provided by the European Union itself. In the case of Poland it is already clear that the funds will be provided from the facility Instrument for Structural Policies for Pre-Accession (ISPA). The European Union declares major interest in sharing the costs of investment in public capital. Thus the funds can be used to reduce the financial burden imposed on lower income households.

Part IV: Summary and Conclusions

The costs of compliance with the EU environmental regulations among the four candidate countries vary substantially. For all scenarios considered here the upper bound of the estimated costs is about twice as high as the lower one (see Table 4.1). For example, under the accession scenario with no transition period, the investment falls on average in the range from 1.6% of GDP in Slovenia up to almost 3.2% of GDP per year in Poland (under the high investment scenario).

Table. 4.1.

Costs of compliance – Summary

(% of GDP annually)

Country	Scenario 1	Scenario 2b	Scenario 2a	
	2005	**2005+3**	**2010**	**2010+2**
Slovenia	1.56	1.07	0.87	0.72
Czech Republic	1.65	1.05	0.86	0.76
Hungary	2.12-2.90	1.44-1.97	1.17-1.60	0.97-1.39
Poland	1.64-3.17	1.11-2.16	0.90-1.74	0.75-1.45

However, the differences need not be interpreted as resulting from enormous actual discrepancies among the countries between the cost structures and investment needs. In addition to the slightly different environmental conditions that were considered as initial conditions, the differences in estimates can largely be attributed to methodological discrepancies among the calculation procedures. Each of the studies, the results of which provided the basis for our extrapolations, had a very different definition of the problem areas that were used as basic units, so the areas of investment covered are not easily comparable. Some of the studies provided underestimates because they simply omitted parts of total costs. For example, the Czech estimates did not include investment in air pollution reduction from mobile sources and very likely ignored the major part of public investment, while the World Bank's estimates of Polish costs, on the contrary, focused exclusively on public sector investment.

On the other hand, environmental investment presented in per capita terms seems to follow a consistent pattern. The costs are close to bln EUR 1 per million citizens across all four countries (see Table 4.2.).[17] Thus, the results can be judged, despite their many biases, as reasonably compatible.

Table. 4.2.

Per Capita Environmental Investment

Country	Total Investment (bln EUR '98)	Population (mln)	Investment per Capita (thousand EUR)
Slovenia	2.7	2.0	1.35
Czech Republic	7.5	10.3	0.73
Hungary	9.5-13	10.2	0.93-1.3
Poland	22.1 - 42.8	38.7	0.57-1.1

Further discrepancies in the estimates are associated with the distribution of total investments between the private and public sectors. Here we observe a consistent pattern among Slovenia, Hungary and Poland, whereby the public sector is expected to contribute around 65% of the total investment cost (see Table 4.3.). The exception is the Czech estimate, which predicts that the public sector will contribute only 4%.

[17] The only inconsistency in this pattern is the low estimate of the Polish costs. This, however, could easily be ignored since, as we have established, the calculations consider only the public investment and as such provide highly underestimated results.

Table. 4.3.

Public/private investment: Summary

Country	Private	Public
Slovenia	30	70
Czech Republic	96	4
Hungary*	27	62
Poland	30-40	60-70

* The remaining 11% of investments are expected to be covered from EU funds.

This result contrasts with the distribution of expenditures that have been already carried out in the Czech Republic, where public sector investment covers about 50 percent of the total costs. One possible reason for this odd estimate is that the estimated costs are in fact exclusively related to private sector investment. This reasoning could also explain the relatively low total costs compared to the remaining three countries.

Overall, the estimates presented here are the only ones available in mid-1999, and thus, despite their obvious weaknesses, should be treated as providing a general range of approximation. In all cases, the short-term scenarios result in high annual investment needs that often significantly exceed the maximal capabilities of the national economies. These results confirm that all candidate countries will need transition periods in order to meet the EU requirements without distorting their economies.

Finally, the results demonstrate the urgent need for an original detailed cost analysis, based on a consistent methodology, which would provide comparable and reliable results.

Appendix 1. Slovenian Estimates

Table A1.1.
Total cost of compliance

Category:	Directives	Estimate (mln EUR '98)
WATER:		**1182.9**
• Administrative and institutional consequences		4
• Socio-economic consequences:	91/271/EEC	889.00
	76/464/EEC	24.80
	80/778/EEC	235.10
	76/160/EEC	30
AIR		**240.90**
• Administrative and institutional consequences:		0
• Socio-economic consequences:	80/779EEC	80
	81/857/EEC	
	89/427/EEC	
	85/203/EEC	100
	82/884/EEC	40
	94/63/EEC & COM (96) 538	20.90
WASTE:		**1118.05**
• Administrative and institutional consequences:		0
• Socio-economic consequences:		
	92/112/EEC	166
	89/429/EEC & 89/396/EEC	311
	94/67/EEC	275
	COM(97)105	321
	75/442/EEC	45.05
HORIZONTAL:		**10.30**
• Socio-economic consequences:	85/337/EEC	10.30
FORESTRY & NATURE:		**120**
• Administrative and institutional consequences		10
• Socio-economic consequences:	92/43/EEC; 86/3528; EEC/2158/92	110
INDUSTRIAL POLLUTION AND RISK MANAGEMENT:		**50.20**
• Administrative and institutional consequences		0.20
• Socio-economic consequences:	88/609/EEC; 96/82/EC	50
CHEMICALS AND GMO:		**0.20**
• Administrative and institutional consequences	90/219/EEC	0.20
TOTAL:		**2672.35**

Table A1.2.

Annual cost distribution in terms of percentage of GDP

Year	GDP growth*	GDP mln EUR	Scenarios 1 and 2a		Scenario 2b	
			2005	2005+3	2010	2010+2
1998	0.040	18909.09	1.78	1.30	1.10	0.95
1999	0.035	19570.91	1.72	1.25	1.06	0.92
2000	0.040	20353.75	1.66	1.20	1.02	0.88
2001	0.045	21269.66	1.59	1.15	0.98	0.85
2002	0.045	22226.80	1.52	1.10	0.93	0.81
2003	0.040	23115.87	1.46	1.06	0.90	0.78
2004	0.045	24156.09	1.40	1.01	0.86	0.75
2005	0.045	25243.11	1.34	0.97	0.82	0.71
2006	0.045	26379.05		0.93	0.79	0.68
2007	0.046	27592.48		0.89	0.75	0.65
2008	0.046	28861.74		0.85	0.72	0.62
2009	0.046	30189.38			0.69	0.60
2010	0.047	31608.28			0.66	0.57
2011	0.047	33093.87				0.54
2012	0.047	34649.28				0.52
Average			**1.56**	**1.07**	**0.87**	**0.72**

*Predicted real GDP growth from "World Economic Outlook" March 1999, WEFA Group.

Table A1.3.

Costs by sectors

Category:	Mln EUR '98	%
• Central government	224	12
• Municipalities	1041	58
• Industry	1265	21
• Households	160	9
TOTAL:	**2690**	**100**

Appendix 2. Czech Estimates

Table A2.1.
Total cost of compliance[18]

Category:	Estimate in (mln EUR '98)
WATER:	**4064**
• Socio-economic consequences:	3840 + 224*
• Drinking Water Supply	~1920
• Wastewater Treatment & Surface Water Protection	~1920
AIR	**1750**
• Socio-economic consequences:	305 + 1445*
WASTE MANAGEMENT:	**881**
• Socio-economic consequences:	637 + 244*
NOISE:	**123**
GENETIC	
• Socio-economic consequences:	**104**
NATURE & FOREST	
• Socio-economic consequences:	**1.5**
HORIZONTAL:	
• Socio-economic consequences:	**4**
TOTAL:	**6927.5**

*These costs are recalculated from the item defined as *industrial pollution* (*National Programme...*, 1999). The industrial pollution cost estimate was decomposed here into the three major sub-components: air pollution (71%), water pollution (11%) and waste management (12%). The remaining 6% is treated as cost associated with noise reduction. The percentage-wise decomposition is based on the data from *National Programme..*,1999, reporting the composition of environmental investment in the industrial sector based on 1996 survey data.

[18] The estimates are based on calculations from *National Programme...* (1999). In addition, costs include "institutional strengthening" interpreted as administrative costs containing investment in salaries of new staff members (mln EUR 70), and material equipment (mln EUR 8), as discussed in section 3.2.2.a and presented in Table 3.2.2.

Table A2.2.

Additional administrative employment required in the Czech Republic*

	Central Administration	Czech Environmental Inspection	Districts & Others
• Horizontal Legislation	14	10	134
• Air Quality	11	65	122
• Waste Management	12	40	206
• Water Quality	4	73	114
• Nature Protection	7	31	107
• Industrial Pollution (including noise)	14	46	133
• Chemicals and GMOs	11	76	171
TOTAL:	**73**	**341**	**989**

*Table adopted from *National Programme...*, (1999).

Table A2.3.
Annual cost distribution in terms of percentage of GDP

Year	GDP growth*	GDP mln EUR	Scenario 1 and 2b		Scenario 2a	
			2005	**2005+3**	**2010**	**2010+2**
1998	-0.023	51317.17	1.67	1.25	1.06	0.91
1999	-0.005	51060.59	1.72	1.31	1.11	0.96
2000	0.029	52541.34	1.81	1.28	1.08	0.94
2001	0.048	55063.33	1.75	1.22	1.03	0.89
2002	0.048	57706.37	1.67	1.16	0.98	0.85
2003	0.048	60476.27	1.60	1.11	0.94	0.81
2004	0.047	63318.66	1.52	1.06	0.90	0.78
2005	0.047	66294.63	1.46	1.01	0.86	0.74
2006	0.047	69410.48		0.97	0.82	0.71
2007	0.046	72603.36		0.92	0.78	0.68
2008	0.046	75943.12		0.87	0.75	0.65
2009	0.046	79436.50			0.71	0.62
2010	0.046	83090.58			0.68	0.59
2011	0.045	86829.66				0.57
2012	0.045	90736.99				0.54
Average			**1.65**	**1.05**	**0.86**	**0.76**

*Predicted real GDP growth from "World Economic Outlook", March 1999, WEFA Group.

Appendix 3. Hungarian Estimates

Table A3.1.

Total cost of compliance (mln EUR '98)

Category:	Directives	Estimate
WATER:		3190-3450
	Drinking water	40-50**
	Natural waters	150-200**
	Sewage collection & treatment	3000-3200
AIR:		3500
	Transportation	2500[19]
	Energy sector	1000
WASTE:		1800-2300
OTHER:		1000
TOTAL:		**9490 – 10250**

[19] The cost of pollution reduction from transportation was provided in the Kerekes and Kiss (1998) report, yet it was not included in their overall estimation. Therefore they estimated the total cost of harmonization to be bln EUR 6.8-7.6.

Table A3.2.a.

Annual costs (including transportation) in percent of GDP*

Based on estimates from Kerekes and Kiss (1998)

Year	GDP growth*	GDP mln EUR	Scenarios 1 and 2b				Scenario 2b			
			2005		2005+3		2010		2010+2	
1998	0.050	47515.15	2.89	3.42	2.10	2.49	1.78	2.10	1.54	1.82
1999	0.050	49890.91	2.76	3.26	2.00	2.37	1.70	2.00	1.47	1.74
2000	0.053	52535.13	2.62	3.09	1.90	2.25	1.61	1.90	1.40	1.65
2001	0.051	55214.42	2.49	2.94	1.81	2.14	1.53	1.81	1.33	1.57
2002	0.050	57975.14	2.37	2.80	1.72	2.04	1.46	1.72	1.26	1.49
2003	0.048	60757.95	2.26	2.67	1.65	1.95	1.39	1.65	1.21	1.43
2004	0.047	63613.57	2.16	2.55	1.57	1.86	1.33	1.57	1.15	1.36
2005	0.047	66603.41	2.06	2.44	1.50	1.77	1.27	1.50	1.10	1.30
2006	0.047	69733.77			1.43	1.69	1.21	1.43	1.05	1.24
2007	0.047	73011.25			1.37	1.62	1.16	1.37	1.00	1.19
2008	0.047	76442.78			1.31	1.55	1.11	1.31	0.96	1.13
2009	0.047	80035.59					1.06	1.25	0.92	1.08
2010	0.047	83797.27					1.01	1.19	0.88	1.03
2011	0.047	87735.74							0.84	0.99
2012	0.046	91771.58							0.80	0.94
Average			**2.45**	**2.90**	**1.67**	**1.97**	**1.36**	**1.60**	**1.17**	**1.39**

*Predicted real GDP growth from "World Economic Outlook", March 1999, WEFA Group.

Table A3.2.b

Annual cost (including transportation) distribution in terms of percentage of GDP

estimated by the EU[20]

Year	GDP growth*	GDP mln EUR	Scenario 1 and 2b		Scenario 2a	
			2005	**2005+3**	**2010**	**2010+2**
1998	0.050	47515.15	2.71	1.97	1.67	1.45
1999	0.050	49890.91	2.58	1.88	1.59	1.38
2000	0.053	52535.13	2.45	1.78	1.51	1.31
2001	0.051	55214.42	2.33	1.70	1.43	1.24
2002	0.050	57975.14	2.22	1.61	1.37	1.18
2003	0.048	60757.95	2.12	1.54	1.30	1.13
2004	0.047	63613.57	2.02	1.47	1.25	1.08
2005	0.047	66603.41	1.93	1.41	1.19	1.03
2006	0.047	69733.77		1.34	1.14	0.99
2007	0.047	73011.25		1.28	1.09	0.94
2008	0.047	76442.78		1.22	1.04	0.90
2009	0.047	80035.59			0.99	0.86
2010	0.047	83797.27			0.95	0.82
2011	0.047	87735.74				0.78
2012	0.046	91771.58				0.75
Average			**2.30**	**1.56**	**1.27**	**1.06**

*Predicted real GDP growth from "World Economic Outlook", March 1999, WEFA Group.

[20] C.f. Compliance Costing (1997).

Appendix 4. Polish Estimates

Table A4.1.

Annual cost distribution in terms of percentage of GDP*

Based on estimates from the World Bank Report (World Bank, 1999)

Year	GDP growth*	GDP mln EUR	Scenarios 1 and 2b				Scenario 2a			
			2005		2005+3		2010		2010+2	
1998	0.048	143650.10	1.92	3.72	1.40	2.71	1.18	2.29	1.03	1.99
1999	0.041	149539.76	1.85	3.58	1.34	2.60	1.14	2.20	0.99	1.91
2000	0.05	157016.74	1.76	3.41	1.28	2.48	1.08	2.10	0.94	1.82
2001	0.051	165024.60	1.67	3.24	1.22	2.36	1.03	2.00	0.89	1.73
2002	0.051	173440.85	1.59	3.08	1.16	2.24	0.98	1.90	0.85	1.65
2003	0.052	182459.78	1.51	2.93	1.10	2.13	0.93	1.80	0.81	1.56
2004	0.053	192130.14	1.44	2.78	1.05	2.03	0.88	1.71	0.77	1.49
2005	0.052	202120.91	1.37	2.65	0.99	1.93	0.84	1.63	0.73	1.41
2006	0.051	212429.08			0.95	1.83	0.80	1.55	0.69	1.34
2007	0.051	223262.96			0.90	1.74	0.76	1.47	0.66	1.28
2008	0.05	234426.11			0.86	1.66	0.73	1.40	0.63	1.22
2009	0.05	246147.41					0.69	1.34	0.60	1.16
2010	0.049	258208.64					0.66	1.28	0.57	1.11
2011	0.049	258208.64							0.57	1.11
2012	0.049	270860.86							0.54	1.05
Average			**1.64**	**3.17**	**1.11**	**2.16**	**0.90**	**1.74**	**0.75**	**1.45**

*Predicted real GDP growth from "World Economic Outlook", March 1999, WEFA Group.

References

Environmental Performance Review, 1998. OECD, Paris.

Compliance Costing for Approximation of EU Environmental Legislation in the CEEC *(1997), EDC Ltd, (Dublin) and EPE asbl (Brussels).*

Gács, J. and M. Wyzan, 1999. *The Time Pattern of Costs and Benefits of EU Accession*, Interim Report IR-99-015, International Institute for Applied Systems Analysis (IIASA), Laxenburg, http://www.iiasa.ac.at/Publications/Documents/IR-99-015, pdf.

Kerekes, S., and K. Kiss, 1998. *Hungary's Green Path to the EU. Summary and progress report*, 1997. Working Paper No 57. Department of Environmental Economics and Technology, Budapest University of Economic Science.

Kerekes, S., and K. Kiss, 1999. *Environmental Requirements for EU Accession. An Impact Study.*(mimeo).

Ministry of Foreign Affairs, Hungary, State Secretariat for Integration. 1999. *National Programme for the Adoption of the Acquis. Hungary.* Vol. II, 15838-3/1999.

National Programme on Preparation of the Czech Republic for Accession to EU, Environment (1999) internal document obtained from the Polish Ministry for Environmental Protection.

Polish Ministry of Environmental Protection, 1999. *Poland. Screening Results. Chapter 22 - Environment*. Commentary of the European Union, Internal document.

Radej, B. 1999. *Analysis of economic trends in 1999 and projections to 2003 - Spring Report,* Institute for Macroeconomic Analysis and Development (forthcoming).

SLO - 101. Development of a Costing Assessment for the Slovenian Environmental Approximation Strategy. Final Report, 28 April 1998.

Statistical Yearbook of the Czech Republic, 1998. Scentia.

Statistical Yearbook of the Republic of Slovenia, 1998. Statistical Office of the Republic of Slovenia.

Statistical Yearbook of the Republic of Poland, 1998. Central Statistical Office.

Statistical Yearbook of Hungary, 1998. Hungarian Central Statistical Office, Budapest, Hungary.

Ujvári, M. 1999. *Nine Critical Green Points,* "Magyar Hirlap" 29 July.

World Bank, Europe and Central Asia Environment Unit, 1999. *Poland Complying with EU Environmental Legislation. Final Report*. Washington D.C. April 1999.

World Bank, Poverty Reduction and Economic Management Unit, Europe and Central Asia Unit. 1997. *Poland Country Economic Memorandum. Reform and Growth on the Road to the EU.* Report No. 16858 - PL.

World Economic Outlook. March, 1999, WEFA Group.

Zylicz, T., 1997. *Social and economic consequences of approximation with the European Union (EU) in the environmental field.* (mimeo), Warsaw, Poland.